

1 CLAIMS:

2 1. A field effect transistor comprising:

3 a pair of source/drain regions having a channel region positioned
4 therebetween; and

5 a gate positioned operatively proximate the channel region, the
6 gate comprising conductively doped semiconductive material, a silicide
7 layer and a conductive diffusion barrier layer.

8
9 2. The transistor of claim 1 wherein the conductive diffusion
10 barrier layer is in contact with the semiconductive material.

11
12 3. The transistor of claim 1 wherein the conductive diffusion
13 barrier layer is not in contact with the semiconductive material.

14
15 4. The transistor of claim 1 wherein the conductive diffusion
16 barrier layer is in contact with the silicide layer.

17
18 5. The transistor of claim 1 wherein the conductive diffusion
19 barrier layer is in contact with both the semiconductive material and the
20 silicide layer.

21
22 6. The transistor of claim 1 wherein the conductive diffusion
23 barrier layer is received over the semiconductive material.

24

1 7. The transistor of claim 1 wherein the conductive diffusion
2 barrier layer is received over the silicide layer.

3
4 8. The transistor of claim 1 wherein the conductive diffusion
5 barrier layer is received over both the semiconductive material and the
6 silicide layer.

7
8 9. The transistor of claim 1 wherein the silicide layer is
9 received over the conductive diffusion barrier layer.

10
11 10. The transistor of claim 1 wherein the conductive diffusion
12 barrier layer comprises W_xN_y .

13
14 11. The transistor of claim 1 wherein the conductive diffusion
15 barrier layer comprises titanium.

16
17 12. The transistor of claim 11 wherein the conductive diffusion
18 barrier layer is selected from the group consisting of TiN, TiO_xN_y , and
19 TiW_xN_y , and mixtures thereof.

20
21 13. The transistor of claim 1 wherein the conductively doped
22 semiconductive material comprises n+ polysilicon.

1 14. The transistor of claim 1 wherein the conductively doped
2 semiconductive material comprises p+ polysilicon.

3
4 15. The transistor of claim 1 wherein the silicide layer and the
5 conductive diffusion barrier layer comprise the same metal.

6
7 16. Integrated circuitry comprising:

8 a field effect transistor including a gate, a gate dielectric layer,
9 source/drain regions and a channel region; the gate comprising
10 semiconductive material conductively doped with a conductivity enhancing
11 impurity of a first type and a conductive diffusion barrier layer; and

12 insulative material received proximate the gate, the insulative
13 material including semiconductive material provided therein in electrical
14 connection with the gate, the semiconductive material provided within
15 the insulative material being conductively doped with a conductivity
16 enhancing impurity of a second type, the conductive diffusion barrier
17 layer of the gate being provided between the gate semiconductive
18 material and the semiconductive material provided within the insulative
19 material.

20
21 17. The integrated circuitry of claim 16 wherein the first type
22 is n and the second type is p.

1 18. The integrated circuitry of claim 16 wherein the first type
2 is p and the second type is n.

3
4 19. The integrated circuitry of claim 16 wherein the gate also
5 comprises a conductive silicide.

6
7 20. The transistor of claim 19 wherein the silicide and the
8 conductive diffusion barrier layer comprise the same metal.

9
10 21. The integrated circuitry of claim 16 wherein the
11 semiconductive material within the insulating material contacts the
12 conductive diffusion barrier layer of the gate.

13
14 22. The integrated circuitry of claim 16 wherein the
15 semiconductive material within the insulating material does not contact
16 the conductive diffusion barrier layer of the gate.

17
18 23. The integrated circuitry of claim 16 wherein the gate also
19 comprises a conductive silicide, the semiconductive material within the
20 insulating material contacting the silicide.

1 24. The integrated circuitry of claim 16 wherein the conductive
2 diffusion barrier layer is received over the gate semiconductive material,
3 and the semiconductive material within the insulating material is received
4 over the gate.

5
6 25. The integrated circuitry of claim 16 wherein the insulative
7 material comprises an opening within which the semiconductive material
8 therein has been provided, the opening being substantially void of any
9 conductive diffusion barrier layer material.

10
11 26. A method of forming a field effect transistor gate
12 comprising:

13 forming a layer of conductively doped semiconductive material over
14 a substrate;

15 forming a layer of a conductive silicide over the substrate;

16 forming a conductive diffusion barrier layer over the substrate; and

17 removing portions of the semiconductive material layer, the silicide
18 layer and the conductive diffusion barrier layer to form a transistor gate
19 comprising the semiconductive material, the conductive silicide and the
20 conductive diffusion barrier layer.

21
22 27. The transistor of claim 26 wherein the silicide layer and the
23 conductive diffusion barrier layer comprise the same metal.
24

1 28. The method of claim 26 wherein the removing comprises:
2 forming a masking layer over the semiconductive material, the
3 conductive silicide layer and the conductive diffusion barrier layer and
4 leaving said portions unmasked by the masking layer; and
5 etching away the unmasked portions to form the transistor gate
6 beneath the masking layer.

7
8 29. The method of claim 26 wherein the removing comprises:
9 depositing, selectively light exposing and developing a layer of
10 photoresist to form a photoresist mask over the semiconductive material,
11 the conductive silicide layer and the conductive diffusion barrier layer
12 and leaving said portions unmasked by the photoresist; and
13 etching away the unmasked portions to form the transistor gate
14 beneath the photoresist.

15
16 30. The method of claim 26 comprising providing the conductive
17 diffusion barrier layer in contact with the semiconductive material layer.

18
19 31. The method of claim 26 comprising forming the conductive
20 diffusion barrier layer after and in contact with the semiconductive
21 material layer.
22
23
24

1 32. The method of claim 26 comprising forming the conductive
2 diffusion barrier layer after and not in contact with the semiconductive
3 material layer.

4
5 33. The method of claim 26 comprising providing the conductive
6 diffusion barrier layer in contact with the silicide layer.

7
8 34. The method of claim 26 providing the conductive diffusion
9 barrier layer in contact with both the semiconductive material layer and
10 the silicide layer.

11
12 35. The method of claim 26 comprising forming the conductive
13 diffusion barrier layer over the semiconductive material layer.

14
15 36. The method of claim 26 comprising forming the conductive
16 diffusion barrier layer over the silicide layer.

17
18 37. The method of claim 26 comprising forming the conductive
19 diffusion barrier layer over both the semiconductive material layer and
20 the silicide layer.

21
22 38. The method of claim 26 comprising forming the silicide layer
23 over the conductive diffusion barrier layer.

1 39. The method of claim 26 comprising forming the conductive
2 diffusion barrier layer to be selected from the group consisting of TiN,
3 TiO_xN_y , W_xN_y and TiW_xN_y , and mixtures thereof.

4
5 40. A method of forming integrated circuitry comprising:

6 forming a field effect transistor gate over a substrate, the gate
7 comprising semiconductive material conductively doped with a conductivity
8 enhancing impurity of a first type and a conductive diffusion barrier
9 layer;

10 forming an insulative layer over the substrate;

11 forming an opening into the insulative layer;

12 forming semiconductive material conductively doped with a
13 conductivity enhancing impurity of a second type within the opening;
14 and

15 providing the doped semiconductive material within the opening in
16 electrical connection with the gate, with the conductive diffusion barrier
17 layer of the gate being received between the semiconductive material of
18 the gate and the semiconductive material within the opening.

19
20 41. The method of claim 40 wherein the first type is n and the
21 second type is p.

22
23 42. The method of claim 40 wherein the first type is p and the
24 second type is n.

1 43. The method of claim 40 comprising forming the gate to also
2 comprise a conductive silicide.

3
4 44. The transistor of claim 43 wherein the silicide and the
5 conductive diffusion barrier layer comprise the same metal.

6
7 45. The method of claim 40 comprising forming the
8 semiconductive material within the opening to contact the conductive
9 diffusion barrier layer of the gate.

10
11 46. The method of claim 40 wherein the semiconductive material
12 formed within the opening does not contact the conductive diffusion
13 barrier layer of the gate.

14
15 47. The method of claim 40 comprising forming the gate to also
16 comprises a conductive silicide, the semiconductive material within the
17 opening contacting the silicide.

18
19 48. The method of claim 40 wherein the opening is filled with
20 conductive material none of which comprises any conductive diffusion
21 barrier layer material.

1 49. A method of forming integrated circuitry comprising:

2 forming a field effect transistor gate over a substrate, the gate
3 comprising semiconductive material conductively doped with a conductivity
4 enhancing impurity of a first type and a conductive diffusion barrier
5 layer received thereover;

6 forming an insulative layer over the gate;

7 forming an opening into the insulative layer to a conductive
8 portion of the gate; and

9 forming semiconductive material conductively doped with a
10 conductivity enhancing impurity of a second type within the opening in
11 electrical connection with the conductive portion, with the conductive
12 diffusion barrier layer of the gate being received between the
13 semiconductive material of the gate and the semiconductive material
14 within the opening.
15

16 50. The method of claim 49 wherein the first type is n and the
17 second type is p.
18

19 51. The method of claim 49 wherein the first type is p and the
20 second type is n.
21

22 52. The method of claim 49 comprising forming the gate to also
23 comprise a conductive silicide.
24

1 53. The method of claim 49 comprising forming the
2 semiconductive material within the opening to contact the conductive
3 diffusion barrier layer of the gate.

4
5 54. The method of claim 49 wherein the semiconductive material
6 formed within the opening does not contact the conductive diffusion
7 barrier layer of the gate.

8
9 55. The method of claim 49 comprising forming the gate to also
10 comprises a conductive silicide, the semiconductive material within the
11 opening contacting the silicide.

12
13 56. The method of claim 49 wherein the opening is filled with
14 conductive material none of which comprises any conductive diffusion
15 barrier layer material.